FMC Idaho LLC, Pocatello, Idaho

POND 16S INTERIM WORK PLAN
GAS EXTRACTION AND TREATMENT

March 8, 2013

MWH

A&E ENGINEERING, INC.

Interim Work Plan

for

Pond 16S Gas Extraction and Treatment

FMC Facility, Pocatello, ID

March 8, 2013

TABLE OF CONTENTS

TABLE OF CONTENTS

Section Page

FIGURES

Note that all Figures are placed behind Section 5.

SECTION 1 INTRODUCTION

1.1 REQUIRED GAS EXTRACTION AND TREATMENT AT RCRA POND 16S

In a letter from EPA dated February 21, 2013 regarding Required Gas Extraction and Treatment at RCRA Ponds 16S and 18A; CERCLA Unilateral Administrative Order for Removal Action, Docket No. CERCLA 10-20100170 (“UAO,” effective July 12, 2010), EPA is requiring FMC to prepare:

1. Readily Implementable Interim Work Plans for gas extraction and treatment at Ponds l6S and l8A that are required within 15 days of this notification and that can be implemented immediately upon approval.
2. Within 30 days after approval of the Readily Implementable Interim Work Plans, FMC shall provide Removal Action Work Plans for longer term operation of gas extraction and treatment at Ponds l6S and l8A.

The EPA February 21, 2013 letter also requires FMC to continue conducting air monitoring in accordance with approved Air Monitoring Plan. The RCRA Pond UAO – SOW Task 1 Air Monitoring Plan (January 2011) was prepared and has been conducted pursuant to the UAO.

1.2 SCOPE OF THIS WORK PLAN

The scope of this Interim Work Plan is to provide the “readily implementable interim work plan” for gas extraction and treatment at Pond 16S as directed by the February 21 EPA letter. As gas extraction and treatment has previously been performed at Ponds 16S and 18A, separate Interim Work Plans have been prepared and submitted for each of these RCRA ponds.

This *Pond 16S Interim Work Plan* is largely based on the previously EPA-approved documents and plans for operation and monitoring of the Pond 16S GETS pursuant to the Pond 16S Unilateral Administrative Order for Removal Action including the Pond 16S GETS Optimization and Operation Plan (October 2008) and Pond 16S Removal Action Work Plan Monitoring and Reporting Plan (October 2009).

1.3 PROJECT ORGANIZATION

The key personnel associated with the performance of the project described in this Interim Work Plan and associated responsibilities presented in the following subsections.

1.3.1 EPA On-Scene Coordinator

The EPA On-Scene Coordinator, as specified in the UAO, is Mr. Greg Weigel, of the Emergency Response Unit, Office of Environmental Cleanup, Region 10.

1.3.2 FMC Remediation Director

The FMC Remediation Director, Ms. Barbara Ritchie, is responsible for overall program implementation, quality and reporting. The Remediation Director is responsible for setting up and procuring the services and ensuring that FMC receives the quality and scope of work described in the contract documents. The Remediation Director is the only person with the authority to change the scope of the project, which is done through the process of change orders and contract modifications.

1.3.3 MWH Project Coordinator

The Project Coordinator will perform overall engineering oversight of the project. The Project Coordinator will interact and communicate directly with the FMC Remediation Director on a regular basis to ensure that the requirements of the contract documents are met and that regulatory issues relating to the UAO are addressed. The MWH Project Coordinator will be Rob Hartman.

1.3.4 KW Health and Safety Manager

The Health and Safety Manager (HSM) has overall responsibility for implementation and maintenance of the site Health and Safety Plan. The HSM is responsible for monitoring and assessing hazardous/unsafe situations, developing measures to assure personnel safety, maintaining the emergency response organization and equipment per the RCRA Contingency Plan, performing job planning safety analyses (JPSA) on job tasks, and training of employees commensurate with their responsibilities. The HSM is also responsible to ensure unsafe acts or conditions are corrected in a timely manner. The Health and Safety Manager is Mark Smith.

SECTION 2 SUMMARY OF PRIOR UAO ACTIONS AT POND 16S

Section 2.1 provides a summary of the prior successful deployment and operation of the GETS at Pond 16S. Section 2.2 provides a summary, primarily by reference, of the PH3 monitoring conducted at Pond 16S pursuant to various plans submitted by FMC and approved by EPA pursuant to the UAO.

2.1 GAS EXTRACTION AND TREATMENT AT POND 16S

The Pond 16S GETS was designed, constructed and operated pursuant to the Pond 16S UAO. The Pond 16S Removal Action Completion Report ("16S RACR," December 2010) documents the gas extraction and treatment and other required tasks undertaken to comply with the Pond 16S UAO. As described in the 16S RACR, the GETS (with the Addendum B modifications completed) operated from October 20, 2008 through November 30, 2010 when the GETS was shut down following demonstration of achievement of the Pond 16S UAO performance objectives. During GETS operation from October 2008 to October 2009, the average TMP source gas PH3 concentration decreased from about 100,000 ppm (and some TMP concentrations were in the range of 200,000 ppm) to below 1,000 ppm and was maintained below 1,000 ppm from November 2009 through GETS shut down in November 2010. Gas extraction using the GETS was successful even during periods of flow restrictions / blockage at several of the TMPs during the operating period.

During January to May 2008, prior to GETS Addendum B operation, the Pond 16S perimeter pipe maximum PH3 concentrations ranged from 26,600 to 82,000 ppm. Although Pond 16S perimeter pipe monitoring was not conducted during GETS Addendum B operation, the Pond 16S south perimeter pipe PH3 concentrations was 0.00 ppm on November 30, 2010 (the day the GETS was shut down).

As expected, the Pond 16S TMP and perimeter pipe PH3 concentration has been increasing ("rebounding") since December 2010. The average Pond 16S TMP PH3 concentration has reached about 24,600 ppm as of the February 2013 monitoring event and the north perimeter pipe standpipe PH3 concentration, consistently the highest PH3 concentrations among the four (4) Pond 16S standpipes, has been in the range of 3,000 to 6,700 ppm over the July 2012 through February 2013 monitoring events.

2.2 PHOSPHINE MONITORING AT POND 16S

Beginning in October 2010, routine, systematic PH3 monitoring was conducted at the RCRA ponds pursuant to various plans submitted by FMC and approved by EPA pursuant to the UAO. The PH3 monitoring at Pond 16S has been conducted pursuant to the following UAO documents:

- RCRA Pond UAO – SOW Task 1 Air Monitoring Plan (January 2011);
- RCRA Pond Phosphine Assessment Study Work Plan – Final (July 2011);
- Monitoring program modifications recommended in the RCRA Pond Phosphine Assessment Study Report (January 2012) and the Technical Memorandum - Fourth Quarter 2012 Update for Ponds 16S and 18A - RCRA Pond Phosphine Assessment Study (January 2013).

The UAO $PH3$ monitoring results have been reported to EPA in the weekly/monthly UAO reports. In addition, the monitoring results and evaluations of those results were presented in the RCRA Pond Phosphine Assessment Study Report (January 2012) and in the 1Q, 2Q, 3Q and 4Q12 Update Tech Memos.

SECTION 3 INTERIM GAS EXTRACTION AND TREATMENT DESIGN AND OPERATION

3.1 APPROACH FOR INTERIM GAS EXTRACTION AND TREATMENT

Based upon the experience and success achieved during the 2008 through 2010 gas extraction, the interim gas extraction and treatment system at Pond 16S will involve the re-initiation of operation of the GETS installed at Pond 16S in 2008. The purpose of this section is to describe the design and operation of the GETS and the overall approach for gas extraction and treatment at Pond 16S.

Section 3.2 provides a description of the design of the GETS. Section 3.3 provides the overall approach for re-start/operation of the GETS at Pond 16S for the interim gas extraction and treatment.

3.2 GETS DESIGN

The GETS design and operation is described below. These sections on the GETS design were taken from the following EPA-approved documents and reflect the GETS design at the time of the system shutdown in November 2010:

- *Pond 16S Final (100%) Design Analysis Report – August 2007*
- *Pond 16S Final (100%) Design Analysis Report – Addendum B – August 2008*
- *Pond 16S GETS Optimization and Operation Plan – October 2008*

3.2.1 Summary of GETS Operating Criteria

The GETS is designed to extract and treat gases from Pond 16S such that tailgas concentrations are at a level that is protective of human health and the environment. The primary operating criteria for the Pond 16S GETS are:

- Extraction flowrate of 0.2 to 10 cfm of gas per TMP.
- Maximum exhaust concentration of PH_3 from the GETS $\leq$ 0.3 ppm with an action level of 0.2 ppm.
- Normal operating PH_3 concentration entering the primary carbon vessel shall be targeted at 300 ppm except under low ambient temperature air conditions.

- Adequate air purge during the cool down phase of operation (i.e., when taking the carbon bed off-line due to the carbon being spent or as result of a planned or unplanned shutdown) to prevent carbon overheating.
- Maximum carbon vessel operating temperature = 250 degrees F.
- Operate the GETS such that gas concentrations from any other discharge point(s) in the system, do not exceed levels that are protective of human health and the environment (including workers and site visitors), even during system upset or maintenance conditions. Discharge point(s) for the GETS have been designed using best engineering practices to protect on-site workers from potential exposure to gases.
- The GETS will be operated so system malfunction or failure are detected and addressed in a timely manner.

3.2.2 Overall GETS Design Configuration

The GETS was designed and constructed in 2008 and is located on the northwest corner of Pond 16S. Since achieving the Pond 16S UAO performance objectives in November 2010, the GETS has remained in-place with monthly start-up to collect monitoring data at Pond 16S and to demonstrate the system is still operational. The GETS is configured into three functional areas, the temperature monitoring points (TMPs), the blending and collection, and treatment. The process flow diagram for the GETS design is shown in Figure 3-1. The three separate functional areas are described in more detail below:

TMPs - There are a total of eight temperature monitoring points (TMPs) incorporated into the Pond 16S cover system. These eight TMPs are connected to an eductor powered by compressed air supplied by a compressor. The compressed motive air creates a vacuum to extract pond gas from the TMP well. The TMP gas is blended instantaneously within the eductor (initial dilution) to less than the PH3 LEL level, such that autoignition of the TMP gas typically does not occur. Normal operation consists of a 1:1 to 10:1 dilution of the pond gas, controllable by manual valves located at each TMP. The diluted TMP gas then flows to the collection area headers.

Blending and Collection - The blending and collection area consists of a north and a south header that collects mixed gas from TMP extractions (four TMPs per header). A primary fresh air blending inlet is provided at the end of each header to further dilute the mixed gas (primary dilution). The two headers then combine to a single gas stream before entering to the treatment system. A secondary air blending inlet is provided to the combined header to dilute the PH3 gas concentration to the inlet target of approximately 300 ppm PH3. Filters are provided at all dilution air inlets to limit moisture content, dust, and other foreign objects from entering the gas stream.

Treatment Area - In the treatment area, the diluted gas from the blending and collection area first passes through a condensate separator to remove liquids in the gas stream. In the current GETS design, the fan providing the motive force for the system is located immediately downstream of the condensate separator. After the fan, the gas passes through primary and secondary carbon vessels to remove the gases of concern (primarily PH3) and then discharges out the GETS stack to the atmosphere. The carbon vessels utilize Calgon Carbon's Centaur® technology to remove PH3 from the extracted pond gases. The Centaur® carbon converts the PH3 to non-toxic, strongly adsorbed phosphorus compounds.

3.2.3 GETS Control

The GETS is designed for manual control. Operators adjust and control TMP flow rates, motive gas flow rates, primary and secondary dilution flow rates in order to meet the operating criteria. The operating criteria are monitored using in-line flow, temperature and pressure instruments and hand-held PH3 monitors.

A safety interlock is incorporated into the system design to shut off all TMP source gas flow and provide for air purge when a high temperature in the combined header is encountered. In the event a carbon vessel high temperature is encountered, safety interlocks will shut off all TMP source gas flow, close the combined header valve, shut off the blower, and close the secondary dilution air valve and flushes the carbon vessels with nitrogen. Further information on the GETS operation is provided in the following subsection.

3.3 GETS Operation

Upon re-start, the GETS will be operated in accordance with operational parameters and procedures used at the time of system shut-down in November 2010. The key operating parameters and procedures are discussed below.

Note that all employees involved in the operation, maintenance, oversight, or supervision of the Pond 16S GETS operation must read, understand, and follow the guidance, procedures, and requirements as presented in the FMC Site-Wide Health and Safety Plan as well as their own company Health and Safety Plan. This will include but not be limited to the RCRA Pond Area Work Rules.

3.3.1 Normal Operating Conditions

During normal GETS operation, targeted operational parameters are as follows:

- The normal blended gas carbon vessel inlet feed rate is 2,200 cfm.
- The normal operating PH_3 concentration entering the primary carbon vessel shall be about 300 ppm except under low ambient air conditions (see Section 3.3.3).
- Maximum outlet operating temperature from the primary carbon vessel shall be 250° F.
- When the PH_3 concentration exiting the primary carbon vessel reaches 10-15 ppm, the primary carbon vessel shall be isolated and the carbon replaced. This is done by positioning the spectacle blinds such that the spare carbon vessel will be in the secondary carbon vessel position and the secondary carbon vessel is moved to the primary carbon vessel position. The carbon in the isolated carbon vessel (formerly the primary carbon vessel) can then be replaced.
- The discharge PH_3 concentration from the secondary carbon vessel (tailgas) shall be less than 0.3 ppm during normal operation. Note that a discharge PH_3 concentration of 0.2 ppm or more would indicate that the operator needs to take action, e.g., reduce the inlet PH_3 concentration.

3.3.2 Tools and Equipment

- High range portable PH_3 gas monitor. Draeger Pac III (or Draeger X-AM 5000) portable monitor calibrated for 0 to 1000 ppm range.
- Low range portable PH_3 gas monitors. Draeger Pac III (or Draeger PAC 7000) portable monitor calibrated for 0 to 20 ppm range for monitoring low concentrations of PH_3.
- Tools and equipment necessary to check and replace instrumentation.
- Parts and tools to perform maintenance on the fan, carbon vessels, piping and instrumentation.
- Tools and equipment necessary to change carbon vessels and to replace carbon, including wrenches, fittings, and spectacle blinds to re-configure carbon vessel piping.
- Safety glasses, gloves, and other required PPE

- Cell phone
- ToxiPro A5.7 PH3 meter with a range of 0-20 ppm PH3 and alarms set at 0.3 ppm and 1.0 ppm (or equivalent monitor for personal protection).
- Fire extinguisher

3.3.3 Non-Routine GETS Operation

Inlet PH3 Concentration During Cold Weather

Historical operation of the GES units has demonstrated safe and efficient operation at a nominal PH3 concentration of 300 ppm to the inlet of the primary carbon drum. However, PH3 breakthrough across the GETS primary carbon vessel has been observed with inlet concentrations of 300 ppm when inlet temperatures were below 50ºF (typically ambient temperatures below 0 ºF). As low ambient temperatures (and thus low inlet temperatures) are suspected to be the root cause of carbon issues experienced under these conditions, the current GETS procedure involves adjusting (lowering) the PH3 inlet concentration when inlet temperatures are below 50ºF.

During normal operation (and inlet temperatures at or above 50 ºF), the inlet PH3 concentration target is 300 ppm. When the primary carbon vessel inlet temperature drops below 50ºF, the operator will reduce the inlet PH3 concentration to approximately 100 ppm. This will be accomplished by adjusting TMP extraction rates (and/or by turning off some TMPs). If the primary carbon vessel temperature drops below 40ºF, all TMPs will be shut off (eliminating PH3 in the inlet) and the system will operate on the fan only. This procedure is designed to avoid an imbalance in PH3 adsorption and PH3 reactions that apparently occur at low ambient (and therefore low carbon bed) temperatures. The fan will remain running during this period and TMPs will be brought back on line when the primary carbon vessel inlet temperatures reach 50ºF and higher.

Normal GETS Shut Down and Cool Down

Normal GETS shutdowns include shutdowns for maintenance, carbon change outs, or other planned shutdowns. The normal GETS shutdown procedure will include an air purge to ensure completion of the PH3 reaction and minimize N2 purging. For a normal shutdown, the fan will remain operating for a minimum of 4 hours after gas from the TMPs has been shut off. This purge time will be determined based upon operating experience and may be a function of ambient temperature. There will be no N2 purge used during a normal shutdown procedure, unless evidence of a carbon fire is present (such as excessive heating of the carbon vessel or outlet gas). Also, when possible, planned GETS shutdowns and startups will be performed only when ambient temperatures allow for primary carbon vessel inlet temperatures of 50ºF or greater (taking into account the temperature gain through the fan), to minimize the impact of colder temperatures on the rate of PH_3 reaction on the carbon.

Upset/Emergency GETS Shut Down

Upset or emergency GETS shutdowns include (but are not necessarily limited to) shutdowns for high outlet temperatures or high PH_3 concentrations at the tailgas. Shutdown procedures for each case are described below:

- In the case of high carbon vessel outlet temperatures (> 250ºF, indicating a possible excessive exothermic reaction in the carbon), the procedure will remain the same as before, i.e., the fan will automatically be shut down and the system will be purged with N_2 for a minimum of 40 minutes.

- In the case of high PH_3 in the tailgas (> 0.3 ppm), the TMPs will be immediately shutdown, but the fan will remain running for a minimum period of 4 hours to ensure the PH_3 reaction is taken to completion. This may be altered (e.g., N_2 introduced) if PH_3 tailgas concentrations remain high or if overheating of the carbon is suspected (as evidenced by smoke at the discharge stack or excessive outlet temperatures). If the tailgas PH_3 concentration remains above 0.3 ppm after shutdown of all TMPs, whether purging with N_2 or with the fan running, tailgas discharge to the GES procedure will be implemented

Power Outage (Electrical Backup)

In the event of a short duration power outage (< 20 minutes), the failsafe interlock will be modified such that N_2 purge of the GETS will not be automatically initiated. Instead, the operator will monitor the temperature of the GETS carbon vessels to ensure overheating is not occurring and manually initiate a nitrogen purge, only if needed based on excessive heating in the carbon units or visible smoke from the GETS stack. Once power is restored, the fan will be started and the system will be purged with air using the fan for a minimum period of 4 hours prior to re-introducing PH_3 into the system. In the event of a longer duration power outage (> 20 minutes), the operator will start the auxiliary diesel generator to provide power to start the fan. Air will be purged through the carbon vessels for the duration of the power outage. Once power is restored, the GETS will be brought back online using line power, with a minimum period of 4 hours of air purge prior to re-introduction of PH_3 to the system. Nitrogen purge through the GETS will only be used in the event of excessive heating of the carbon vessel or visible smoke at the discharge stack) which threatens the carbon, GETS equipment, or a release from the GETS.

Tailgas Discharge to the GES

There have been two instances during the initial GETS operation in which carbon overheating led to N2 purge of the carbon vessels. In these instances, N2 was used to purge at a rate of 50 acfm through the primary and secondary carbon vessel and out the discharge stack. Experience has shown that once N2 is used for carbon purging, the PH3 to H_3PO_4 reactions are greatly reduced or stopped such that resumption of the adsorption and decomposition reactions was difficult to re-establish without process upset.

To prevent potential releases of PH3 under these circumstances, e.g., after a N2 purge was initiated, a procedure will be implemented to divert the purge gas from the carbon vessels to a GES unit, instead of to the discharge stack. A flexible hose will be used to connect the GES to the GETS at a collection point between the primary and secondary carbon vessels. The GES fan will be used to draw the purge gas through the GES where the carbon in the GES will reduce the PH3 concentration to below 0.3 ppm prior to discharge to the atmosphere. Purging through the GES will continue until PH3 levels in the purge gas are below 0.3 ppm.

Spent Carbon Management

The Calgon Centaur® carbon is designed to adsorb PH3 gas and to react the adsorbed gas to phosphoric acid (H_3PO_4). Once carbon in the primary carbon vessel is utilized to the extent practicable (as evidenced by sustained breakthrough of PH3 through the primary carbon vessel), the primary carbon vessel will be switched, moving the secondary carbon vessel to the primary position and the in-line spare vessel to the secondary position. This is accomplished by shutting off the TMPs, purging with air for a minimum of 4 hours, and allowing the PH3 concentration in the inlet and the tailgas to reach 0.0 ppm. This purge time will be determined based upon operating experience and may be a function of ambient temperature. There will be no N2 purge used during the normal shutdown procedure, unless evidence of a carbon fire is present (such as excessive heating of the carbon vessel/outlet gas or visible smoke at the discharge stack). Then the fan is shut down and the piping configuration is manually adjusted for the new carbon vessel configuration, thus isolating the carbon vessel with the spent carbon. This carbon change-out procedure will remain as described previously in the *Pond 16S GETS Final (100%) Design Analysis Report – October 2007*.

At the time the spent carbon vessel (isolated at the inlet and outlet by means of blind flanges) is ready for carbon replacement, a nozzle is provided to allow for measurement of PH3 within the vessel. If PH3 is measured within the vessel at a level of 0.3 ppm or higher, this sealed spent carbon vessel will then be slowly purged with nitrogen or air with the discharge being processed through the primary and secondary carbon vessels (or GES unit) until the PH3 level measured at the outlet of the spent carbon vessel is again below 0.3 ppm.

If the PH3 level measured within the spent carbon vessel is below 0.3 ppm, the carbon replacement will proceed by removing the spent carbon and replacement with new carbon. The removed spent carbon will be placed in a container awaiting waste determination and final disposition. The head space of this spent carbon container will also be measured for PH3 once per batch after all the spent carbon has been placed in the container.

TMP Autoignition

The GETS is designed to extract high concentration PH3 gas from within the Pond 16S cover system and dilute this gas with ambient air to a concentration that can be safely treated in the carbon vessels. As PH3 at concentrations over the LEL (approximately 20,000 ppm) can autoignite when contacting air, the dilution of pond gas to below the LEL is a critical step in the GETS process. Each TMP is equipped with an eductor that provides the vacuum to extract the gas from the TMP and allow for the initial, instantaneous dilution in a manner that inhibits autoignition. However, at times an autoignition of PH3 within the eductor does occur. An autoignition within the eductor can occur at any time, but usually occurs at higher PH3 concentrations, during hot ambient temperatures, and/or during operator adjustment of the manual control valve at the TMP. When an autoignition occurs, the PH3 reacts with oxygen in the dilution air to form P_2O_5 and H_3PO_4. This occurs entirely within the TMP piping and does not create a release to the atmosphere. However, the exothermic reaction immediately heats up the eductor and eductor gas such that the temperature sensor shuts off flow of pond gas from the TMP, thus stopping the autoignition.

The manual control valve at each TMP must be adjusted as part of normal GETS operation to set the PH3 extraction rate and thus the PH3 concentration being fed to the north and south header pipes. As indicated above, autoignitions can occur while the operator is making an adjustment to the manual valve at the TMP and as such, the operator will recognize the autoignition by the temperature increase. The operator will then attempt to restart the TMP following the procedure outlined below. If the operator is not present, i.e., the autoignition occurs on its own, the operator will be notified that the autoignition has occurred and that the TMP is shut off. The operator must then manually bring the TMP back on line following the same procedure as outlined below.

1. The operator will manually close the TMP adjustment valve. The TMP solenoid shut-off valve is typically in the closed position.

2. Once the TMP eductor has cooled, the operator will reopen the TMP solenoid shut-off valve. The operator will then slowly open the adjustment valve to introduce PH3 to the eductor.

3. If an autoignition doesn't occur, the TMP is brought on-line, the flow is adjusted and the TMP is operated normally.

4. If an autoignition does occur, the adjustment valve is immediately closed and the TMP is allowed to cool for several minutes. The process is then started over.

5. If after several attempts, autoignition persists when opening the needle valve, the TMP will be taken off-line. Other TMPs will then be brought on-line or adjusted to achieve the desired carbon treatment inlet PH3 concentration.

6. The TMP eductor with the persistent autoignition problem will be disassembled. The eductor and piping will be washed using water to remove any buildup of H3PO4. Wash water is collected, characterized, and disposed as appropriate.

7. Once the TMP eductor and piping is washed, the eductor is reassembled and the process will be repeated. Typically, cleaning the eductor will typically correct the autoignition problem.

TMP Clearing

As has been experienced on Ponds 16S and 15S when extracting from TMPs, the TMPs can become flow restricted as result of a quantity of sand pack material (used during TMP installation) plugging the bottom of the TMP. This is typically observed as a high vacuum pressure (above 60 inches) at the TMP resulting in dropping extraction flow and PH3 concentrations. If several TMPs become flow restricted, this can cause limitations on PH3 mass removal and inefficient GETS operation, e.g., unable to maintain inlet PH3 concentrations at 300 ppm. A TMP cleaning/drilling procedure was developed at Pond 16S during initial operation and further improved on Pond 15S to allow for the safe removal of the sand pack material and drilling through the bottom of the TMP casing in order to re-establish flow at the plugged TMP. This procedure was approved by EPA in an email dated May 31, 2012. The TMP Mechanical Drilling Procedure (Updated May 24, 2012) is included as Appendix A.

Carbon Replacement

When the PH3 concentration exiting the primary carbon vessel reaches 10-15 ppm, the primary carbon vessel shall be isolated and the carbon replaced. This is done by positioning the spectacle blinds such that the spare carbon vessel will be in the secondary carbon vessel position and the secondary carbon vessel is moved to the primary carbon vessel position. The carbon in the isolated carbon vessel (formerly the primary carbon vessel) can then be replaced.

Newly installed carbon requires “conditioning” before reaching the maximum treatment capacity. Experience has shown that each batch of carbon may require different periods of conditioning. During the initial conditioning period, the inlet concentration shall be reduced to ensure GETS tailgas emission is within the acceptable limits. The discharge PH3 concentration from the secondary carbon vessel (tailgas) shall be less than 0.3 ppm during normal operation. Operators shall observe the second vessel discharge concentration and adjust the TMP inlet flowrate accordingly. An action level shall be set at 0.2 ppm PH3 in the GETS tailgas, i.e., action will be required if the tailgas concentration reaches 0.2 ppm PH3. Actions may be reduction in pond gas flowrate to the treatment system thus reducing the PH3concentration to the treatment system, or ultimately shutting off all TMP gas to the system.

3.3.4 Operational Monitoring

The operation parameters to be monitored during operation of the Pond 16S GETS are described as follow:

1. PH3 concentrations (measured with a hand-held PH_3 monitor) are measured at locations as shown on Figure 3-2:

    a. At the end of north and south collection headers - This measurement indicates the north or the south side collection header diluted gas concentration (each isolated from each other). The isolation of the north and south side allows the system to be diagnosed easily without sacrificing total treatment capacity. For example, the system can be set to operate primarily from the south side collection header while operating the north side TMPs one at a time for evaluation (e.g. determination of TMP gas PH3 concentration, short-circuiting, etc.). Hand-held PH3 monitors (Draeger Pac III [or X-AM 5000 / Pac 7000]) portable monitor calibrated for 0 to 1000 ppm, and 0 to 20 ppm PH3) are used for this monitoring.

    b. At inlet to primary carbon adsorption vessel – This measurement is used to maximize PH3 treatment through the carbon vessels. The target inlet PH3 concentration is 300 ppm The inlet PH3 concentration is controlled by adjusting the total TMP extraction flowrates and primary air dilution flow rates while fine-tuning by adjusting the secondary air dilution flowrate. Hand-held PH3 monitors (Draeger Pac III [or X-AM 5000 / Pac 7000]) portable monitor calibrated for 0 to 1000 ppm, and 0 to 20 ppm PH3) are used for this monitoring.

c. At the exit from primary carbon vessel – This measurement is used to compare with inlet PH3 concentration to determine the carbon performance (treatment efficiency, breakthrough, etc.) of the primary carbon vessel. Hand-held PH3 monitors (Draeger Pac III [or X-AM 5000 / Pac 7000]) portable monitor calibrated for 0 to 1000 ppm, and 0 to 20 ppm PH3) are used for this monitoring.

d. At exit from secondary carbon vessel (GETS tailgas) – This PH3 measurement is used to ensure that discharge to atmosphere is less than 0.3 ppm . As indicated above, a discharge concentration of 0.2 ppm will require action on the part of the operator to bring the discharge PH3 concentration down. Hand-held PH3 monitors (Draeger Pac III [or X-AM 5000 / Pac 7000]) portable monitor calibrated for 0 to 1000 ppm, and 0 to 20 ppm PH3) are used for this monitoring.

   During normal operational periods, tailgas monitoring will be conducted three times per operating shift. Normal operational periods are those during which the system is operating steadily at the intended capacity. These are periods when it would be expected that the GETS is performing relatively consistently over time.

   During non-routine operational periods, e.g., after a carbon changeout and the new carbon vessel is brought on-line, tailgas will be monitored more frequently until the carbon is determined to be conditioned. During non-routine operational periods such as after a carbon change-out, operators will make correctional adjustments to the process if any tailgas reading exceeds 0.20 ppm PH3. This “action level” provides a buffer of another 50 percent increase in discharge concentration before reaching 0.3 ppm PH3.

2. Flow rates (venturi flowmeters, pitot tube flowmeters, and rotameters are used at various locations):

   a. At each TMP outlet, a venturi flowmeter is used to measure the flowrate of TMP gas being extracted and entering the system. Temperature and pressure of gas stream is also measured and used to correct the flow to scfm. This measurement is used to determine total extracted flow from the pond. Due to the change in TMP gas flowrate over the life of the project (i.e., low flow during the high PH_3 concentration phase to high flow during the low PH_3

concentration phase) several different venturi flowmeters are expected to be used.

b. North and south collection headers are equipped with a pitot tube-type flowmeter. Temperature and pressure of gas stream is also measured and used to correct the flow to scfm. This measurement is also used to calculate north and south header average source gas concentrations

c. Upstream of condensate separator, a pitot tube-type flowmeter is used to measure the total flow of diluted TMP gas into the treatment system. This flow rate is corrected to scfm using in-line temperature and pressure measurements. This measurement is used to calculate pond gas PH3 concentration estimates. .

d. Eductor motive air at each TMP is measured by a rotameter. The motive air provides the initial dilution of the pond gas to ensure that the PH3 concentration is always below the LEL.

3. Temperature (in-line temperature measurements are used for flow rate correction calculations and to monitor equipment operation):

   a. Downstream from the TMP eductors to monitor for autoignition.

   b. Inlet and outlet of primary and secondary carbon vessels to adjust PH_3 inlet concentration for optimum carbon treatment, for possible excessive carbon exothermic reactions, and for treatment performance.

4. Pressure (in-line pressure measurements are used for flowrate corrections and system performance monitoring):

   a. Inlet and outlet of primary carbon vessel to monitor possible pluggage of the carbon bed.

5. Tank levels:

   a. Condensate tank level monitored by sight glass for condensate removal.

   b. Nitrogen cylinder(s) level (gauged by pressure) to ensure adequate inventory and for reordering purposes.

3.3.5 Data Analysis

Using the process monitoring data as described above, the following operation performance will be evaluated (or estimated by calculation).

Average Source Gas Concentration

The average source gas (gas extracted from the TMPs) PH3 concentration will be calculated from the inlet concentration, inlet flowrate, and total TMP extraction flowrate, i.e., equal to the product of concentration at the inlet to primary carbon adsorption vessel and flowrate upstream of condensate separator divided by the sum of all active TMP extraction flowrates.

3.3.6 Planned GETS Operation at Pond 16S

As demonstrated during the operation of the GETS on Pond 16S from October 2008 through November 2009, continuous (24 hour per day, seven day per week or “24/7”) operation of the GETS connected to the eight Pond 16S TMPs successfully decreased Pond 16S average source gas PH3 concentrations from about 100,000 ppm (and some TMP concentrations were in the range of 200,000 ppm) to well under 2,000 ppm over about 14 months. Pond 16S source gas PH3 concentrations further decreased during the 12 month demonstration period that including the period when GETS operation went to 12 hours per day, seven days a week (12/7) to well below 1,000 ppm.

Therefore, the interim gas extraction and treatment system approach for Pond 16S is as follows:

- Begin gas extraction from the Pond 16S using the GETS extracting from TMPs within 10 days after EPA approval of this Work Plan and EPA direction to commence gas extraction pursuant to the approved plan. Initially, the GETS will be operated continuously (24/7).

- Implement (or continue to implement) the PH3 monitoring at 16S as described in Sections 3.3.4, 4.1 and 4.2.

As described in the Framework for Post-Closure Operation and Maintenance of RCRA Pond Gas Extraction and Treatment Systems (December 2012), the GETS connected to the Pond 16S TMPS, operating on a 24/7 schedule will achieve a minimum monthly-averaged PH3 mass removal rate of 30 pounds per day (lb/day) provided the source gas PH3 concentration remains above 8,000 ppm.

The operation of the GETS may be modified over time, based on monthly review of the monitoring data, to decrease the monthly-averaged daily PH3 mass removal rate. This may be necessary to maintain efficient GETS operation, e.g., maintain 300 ppm inlet PH3 concentrations. Gas extraction at one or more of the Pond 16S perimeter pipe standpipes may be initiated using GES units in addition to or instead of GETS operation. Any GES units deployed to Pond 16S would be operated pursuant to the procedures and monitoring specified in the Pond 18A Interim Work Plan (March 8, 2013). The rate of PH3 removal from Pond 16S may be decreased by reducing the operating time of GETS or by replacing GETS operation with one or more GES units extracting from the perimeter pipe. FMC will notify EPA and obtain EPA approval prior to decreasing the GETS operating schedule and/or deploying GES units at Pond 16S.

When the monthly north perimeter pipe standpipe PH3 concentration decreases below 2,000 ppm as measured using the dilution box method specified in Section 4.3.2.2, FMC will notify EPA and cease gas extraction and treatment at Pond 16S. Monitoring will continue pursuant to the then-applicable EPA-approved plan (e.g., Air Monitoring Plan, amended RCRA Pond Post-Closure Plan).

3.4 WASTE MANAGEMENT

Based upon experience with the existing gas extraction and treatment systems, generation of the following solid wastes are anticipated for the Pond 16S GETS installation and operation:

- Spent carbon;
- Condensate;
- TMP packing sand generated during TMP cleaning/drilling; and
- Construction and maintenance debris.

These anticipated solid waste streams are discussed below.

Spent Carbon

Approximately 7,500 pounds of spent activated carbon is anticipated to be generated each time the carbon is replaced in a carbon vessel. The point of generation of this waste stream will be upon removal of the spent carbon from the carbon treatment vessels. Based upon testing, process knowledge, and experience with the existing gas extraction and treatment systems, the spent carbon is not anticipated to be a hazardous waste per 40 CFR Part 261. However, a periodic waste determination will be performed and documented per 40 CFR § 262.11.

Condensate

Condensate may be generated during operation of the GETS. While dependent on ambient temperature, the point of generation of this waste stream will be upon removal of the condensate from the eductors and/or condensate separation vessel. Based upon testing, process knowledge, and experience with the existing gas extraction and treatment systems, the condensate is not anticipated to be a hazardous waste per 40 CFR Part 261. However, a periodic waste determination will be performed and documented per 40 CFR § 262.11.

TMP Packing Sand

Varying amounts of packing sand may be removed from TMPs using the TMP cleaning/drilling procedure. The amount of TMP packing sand generated will be dependent on the number of TMPs that must be cleaned, but generally a small amount, i.e., 1 to 10 pounds per TMP cleaned. Based upon previous testing, process knowledge, and experience with the existing gas extraction and treatment systems, the packing sand is not anticipated to be a hazardous waste per 40 CFR Part 261. However, a periodic waste determination will be performed and documented per 40 CFR § 262.11.

Maintenance Debris

Varying amounts of maintenance debris is anticipated to be generated from the operation of the GETS. The point of generation of these waste streams will be upon the point of disposal. Although these wastes are not anticipated to be hazardous per 40 CFR Part 261, a waste determination will be performed and documented per 40 CFR § 262.11 with the initial generation of each waste category, i.e., packaging materials, replaced equipment, sampling/monitoring wastes, spent PPE, etc.

Wastes that have been determined to be non-hazardous per 40 CFR § 262.11 will be either disposed on site or transported offsite for recycle or disposal. Wastes that are determined to be hazardous per 40 CFR § 262.11 will be managed in accordance with the regulatory requirements of 40 CFR Part 262, 265, and 268 including but not limited to:

- Land disposal restrictions per 40 CFR Part 268;
- EPA identification number per 40 CFR Part 262.12;
- On-site hazardous waste accumulation (storage) per 40 CFR § 262.34(d);
- If the waste is placed in containers, the requirements of 40 CFR Part 265 Subpart I;
- If the waste is placed in tanks, the requirements of 40 CFR 265 Subpart J (tank requirements):
- At closure, the storage area is closed per the requirements of 40 CFR § 265.111 and 40 CFR § 265.114;
- Preparedness and prevention requirements of 40 CFR Part 265 Subpart C;
- Contingency plan and emergency response requirements of 40 CFR Part 265 Subpart D;
- Training requirements of 40 CFR § 265.16;
- Satellite accumulation requirements of 40 CFR § 262.34(c);
- Manifesting off-site shipments of hazardous per 40 CFR § 262.20; and/or
- Reporting and recordkeeping per 40 CFR § 262.40.

SECTION 4 MONITORING AND REPORTING

4.1 MONITORING UNDER THE AIR MONITORING PLAN

Monitoring pursuant to the Air Monitoring Plan will be performed at Pond 16S during gas extraction and treatment. The monitoring will be performed following the procedures detailed in the Air Monitoring Plan (January 2011).

- Air Monitoring per the Air Monitoring Plan – Part I
  - Pond appurtenance air monitoring and leak detection at the 8 TMP enclosures, 2 ET cap drainage collection lift stations, 2 LCDRS sumps, 5 instrument panels and 4 standpipes at Pond 16S will initially be performed on a monthly basis. After twelve (12) consecutive months of appurtenance monitoring, if there have been no detections at or above 0.05 ppm of PH3 at any appurtenance, the monitoring frequency will reduce to quarterly. After four (4) consecutive quarters of appurtenance monitoring, if there have been no detections of PH3 at or above 0.05 ppm of PH3 at any appurtenance, the frequency will be reduced to annually for Pond 16S. The Pond 16S appurtenance monitoring locations are shown on Figure 4-1.
  - Pond perimeter surface scan monitoring will be performed at Pond 16S on a monthly basis, provided that required weather conditions allow such monitoring during the month. After twelve (12) consecutive months of cap perimeter surface monitoring at Pond 16S, the monitoring frequency will be reduced to quarterly provided that there are no detections of PH3 at or above 0.05 ppm at the cap perimeter surface. After four (4) consecutive quarters of cap perimeter surface monitoring, if there are no PH3 detections at or above 0.05 ppm of PH3 at the cap perimeter surface, this monitoring frequency will be reduced to annually on Pond 16S. The Pond 16S surface scan monitoring locations are shown on Figure 4-2.
  - Pond cap surface scan – if triggered by pond perimeter surface scan.
  - Low-lying areas – if triggered by monitoring listed in previous three sub-bullets.
- Air Monitoring per the Air Monitoring Plan – Part II
  - Continuous monitoring at two locations at Pond 16S. The Pond 16S continuous monitoring station locations are shown on Figure 4-3.
  - Fenceline monitoring - if triggered by criteria set forth in the Air Monitoring Plan; and Off-site monitoring – if triggered by fenceline monitoring criteria set forth in the Air Monitoring Plan.

In addition to the above Air Monitoring Plan monitoring, inside appurtenance monitoring will be performed monthly at the same time as the appurtenance air monitoring and leak detection monitoring. Note that there is no inside monitoring at perimeter pipe standpipes. The inside appurtenance monitoring will be performed following the procedures detailed in Section 3.4 of the Phosphine Assessment Work Plan – Final (July 2011). The TMP appurtenance monitoring procedure for Pond 16S will include leak detection monitoring of the GETS extraction piping components from the TMP enclosure to the solenoid valve at the Pond 16S TMPs as described in RCRA Pond UAO Weekly Report #114 (October 17, 2012).

4.2 GETS Area Monitoring

During GETS operation extracting pond gas from the TMPs, the GETS area process vessels, connection, valves, and the effluent stack will be monitored for PH3 at least once per shift. GETS area monitoring during routine operation is described in Section 4.2.1 and monitoring during non-routine operations is described in Section 4.2.2.

4.2.1 GETS Area Monitoring During Routine GETS Operation

Real time PH3 monitoring will be conducted while walking around the immediate GETS area. GETS area ambient air monitoring will be conducted continuously while walking around the perimeter of the system at a distance not exceeding 25 feet from the system. Monitoring will utilize a warmed-up, calibrated Dräeger Pac III (or Pac 7000) gas monitor (0 to 20 ppm range version), set in the operator’s breathing zone while walking. The treatment system perimeter will be traversed at a comfortable walking speed or approximately 3 miles per hour. The PH3-meter alarm will be set to sound if $\geq$0.20 ppm phosphine is detected. The operator will stop at the north, south, east, and west sides of the perimeter, for at least 1 minute, and record a stable reading in that location. The GETS area ambient air monitoring will typically be performed once per shift, preferably at times when winds are relatively calm. If PH3 alarms are observed during the GETS area monitoring perimeter walk, the location(s) will be flagged for further investigation and, when it’s safe and advisable to do so, will attempt to locate, document, and remedy (if possible) the source of any elevated PH3 concentrations.

4.2.2 GETS Area Monitoring During Non-Routine GETS Operation

There may be periods of non-routine GETS operation when additional GETS area monitoring is warranted. These non-routine GETS operational periods include:

- Activities when unpurged GETS process piping or equipment is opened to the atmosphere such that PH3 could escape the atmosphere;
- Opening of unpurged carbon vessels to replace spent carbon; or

- Suspected leaking or venting of process gases.

During these non-routine operational activities, GETS area monitoring for PH_3 will be performed as described in Section 4.2.1.

It should be noted that the standard procedure will be to purge the GETS with air and/or nitrogen prior to opening any process piping, vessel, or equipment to atmosphere. This procedure will be followed to purge any PH_3 in the system through the carbon for removal to bring PH_3 down to below 0.3 ppm. This purging will be confirmed by testing the tailgas at the end of the purging cycle and testing the process gases at the point of breaking open process piping, vessels or equipment. If this purging procedure is followed, then additional GETS area monitoring is not planned as emissions of PH_3 gas above 0.3 ppm would not be expected.

For example, during a carbon change-out, the TMP gas will be shut off and the system allowed to purge with ambient air by drawing the dilution air through the carbon vessels using the system blower. Both the inlet to the primary carbon vessel and the discharge from the GETS system will be checked to ensure that PH_3 concentrations are below 0.3 ppm prior to completing the system purging. Once purged with air, the spectacle blinds at the carbon vessels will be changed to place the in-line spare vessel to the secondary position, the second vessel to the primary position, and the spent primary vessel to the spare position. The system will then be brought back on line, using increased tailgas monitoring as outlined in Section 4.3.1.2 until the carbon is fully conditioned.

In addition to the GETS area monitoring during non-routine GETS operation described here, safety procedures require that personnel working in the area will have a personal PH_3 meter to monitor PH_3 concentrations in the area.

At the time the spent carbon vessel (isolated at the inlet and outlet by means of blinded flanges) is ready for carbon replacement, the door will be partially unbolted and slightly opened to allow for measurement of PH_3 within the door. If PH_3 is measured within the door at a level of 0.3 ppm or higher, the door will immediately be sealed and bolted up. This sealed spent carbon vessel will then be slowly purged with nitrogen with the discharge being processed through the primary and secondary carbon vessels until the PH_3 level measured at the outlet of the spent carbon vessel is again below 0.3 ppm.

If PH_3 level measured within the spent carbon vessel door is below 0.3 ppm, the carbon replacement will proceed by removing the spent carbon and replacing with new carbon. The removed spent carbon will be placed in a container awaiting waste determination and final disposition. The head space of this container will also be measured for PH_3 once per batch after all the spent carbon has been placed in the container.

4.3 Pond 16S Perimeter Piping Gas PH3 Monitoring

During GETS operation extracting pond gas from the TMPs, the Pond 16S north perimeter gas collection pipe standpipe will be monitored monthly utilizing a GES unit. The sampling train calibration procedures are described in Section 4.3.1 and the perimeter pipe PH3 sampling procedure is described in Section 4.3.2.

4.3.1 Sampling Train Calibration Prior to the Perimeter Piping Monitoring Event

Calibrate Draeger Pac III PH3 Monitor: The Draeger Pac III field monitor[1] (0 to 1,000 ppm) will have been calibrated with 500 ppm PH3 standard calibration gas (see calibration procedure included in Appendix A-5B) within 14 days prior to any perimeter piping monitoring event.

Calibrate Sample Train Dilution Box: Also, within 14 days prior to any perimeter piping sampling event, the sampling train dilution box will be calibrated using 500 ppm PH3 standard calibration gas and using various dilution ratios (N2 to PH3) to confirm the accuracy of the dilution box.

To avoid release of PH3 to the environment, the PH3 calibration gas used in this calibration procedure will be collected in a Tedlar bag. The Tedlar bag will then be discharged to an operating GES or the GETS for treatment prior to release to atmosphere.

The perimeter piping sampling train calibration procedure follows:

1. Calibrate the Draeger Pac III PH3 monitor.

2. Position perimeter piping sampling train in the sampling lab. The equipment includes:

    - Gas dilution manifold
    - High-range (0 to 1,000 ppm) Draeger Pac III PH3 monitor equipped with a Draeger calibration cap.
    - Nitrogen gas cylinder for sample dilution

[1] Draeger has discontinued manufacturing the Pac III monitors but according to a Draeger representative they will continue to provide sensors and basic repairs for the Pac III. The Pac III is being replaced by the Draeger Pac 7000 for the low range PH3 sensor (0 – 20 ppm) and the by the X-AM 5000 for the high-range PH3 sensor (0-1,000 ppm). FMC may utilize the Pac III, Pac 7000, X-AM 5000 or equivalent monitors for the gas monitoring program.

- PH3 calibration gas cylinder (500 ppm)
- Tedlar bag for the collection of gas discharged from the Draeger Pac III monitor.
- Mass flow meters in the dilution manifold indicate the flow rate of calibration gas and dilution gas (nitrogen). The combined total flow of the PH3 calibration gas and any nitrogen dilution gas should be approximately 500 SCCM. This is the flow for which the Draeger Pac III calibration cap is designed.

3. Connect the nitrogen dilution gas to the designated flow meter on the dilution box.

4. Connect the PH3 calibration gas to the designated flow meter on the dilution box.

5. Connect the Draeger Pac III PH3 monitor (0 to 1,000 ppm range) to the discharge line from the dilution box.

6. Connect the exhaust tubing from the Draeger Pac III PH3 monitor calibration cap to the inlet port of a Tedlar bag. Open the inlet valve on the Tedlar bag.

7. Begin dilution box calibration by opening the valve to the PH3 calibration gas line only and start sampling using only calibration gas at a flow of approximately 500 SCCM. After the Draeger monitor reading has stabilized, record the base line PH3 concentration.

8. Repeat the previous step using both PH3 calibration gas and nitrogen dilution gas connected to the dilution box. Adjust the flow rates of both the PH3 calibration gas and nitrogen dilution gas to ratios of approximately 0.5:1, 1:1, 2:1, and 3:1. Record the flow rates. The total gas flow of PH3 calibration gas and nitrogen dilution gas should be approximately 500 SCCM (specified by Draeger for their PH3 monitors). Record the Draeger monitor PH3 concentration for each dilution ratio.

9. After the calibration is completed, close the valve to the PH3 calibration gas line and disconnect the line. Allow the nitrogen dilution gas to run until the sampling equipment has been purged into the Tedlar bag.

10. After the sampling equipment is purged, then close the valve to the nitrogen dilution gas and disconnect the line. Close the Tedlar bag inlet. (The contents of the Tedlar bag must be discharged back into an operating GES or the GETS system.)

11. Calculate the source gas concentration using data collected from Step 9.

    Calculated source gas concentration = (Draeger reading) x [(N2 flow + PH3 flow) / PH3 flow].

12. Compare the calculated source gas concentration with the baseline concentration and compute % error.

    Error = [(Calculated source gas ppm – Baseline ppm) / Baseline ppm] x 100

13. If the average % error is less than 5%, then the dilution box calibration is complete and the perimeter piping sample train is considered to be within acceptable tolerance limits.

4.3.2 Perimeter Gas Collection Piping PH3 Sampling Procedures

Perimeter piping sampling is to be performed in two steps. The first step is a screening level sampling to establish the screening level PH3 concentration and is based upon a calculation using operating parameters from the GES. The second level is to perform a more accurate PH3 concentration measurement using a direct gas sampling method, if the screening level is less than 10,000 ppm PH3.

4.3.2.1 Screening-Level Perimeter Piping Gas PH3 Sampling Procedure

This procedure is intended for initial screening of PH3 concentration in a RCRA Pond perimeter piping system when PH3 concentrations are unknown or known to be 10,000 ppm or greater.

1. As this procedure is used when perimeter piping gas PH3 concentration is unknown, it should be assumed that the PH3 levels are very high, i.e., the concentration is well above the concentration that is immediately dangerous to life or health (IDLH = 50 ppm) and possibly above the lower explosive limit (LEL = 20,000 ppm). Sampling personnel should wear a low-range (0 to 20 ppm PH3) monitor and complete all work in compliance with the *RCRA Pond Area Work Rules*. Approach the perimeter piping riser with a Draeger Pac III field instrument (0 to 20 ppm range) measuring ambient air PH3 concentrations. Check and record the PH3 concentration at the breathing zone (approximately 4 to 5 feet above the ground surface). Note that all RCRA pond TMPs are within the RCRA Pond Area and *RCRA Pond Area Work Rules* will apply to all persons entering this area. In addition, all personnel alarms will be recorded including the measurement reading and location (by GPS). An investigation will be performed and documented to determine, if possible, the source of the PH3 causing the alarm.

2. Connect the GES unit to the designated perimeter piping riser.

3. Start up the GES to the perimeter piping for at least three perimeter piping volumes turn-over using standard GES operating procedures. Note that the time necessary to

extract one perimeter piping volume will be dependent on the PH3 concentration in the perimeter piping and total perimeter piping volume. The purge time will be determined for each pond during the initial purging operation. The GES should remain connected to the perimeter piping and operating during the sampling to provide the motive force for the extraction from the perimeter piping and treatment of extracted perimeter piping gas.

4. After purging the perimeter piping using the GES, the following operating parameters are measured or calculated and recorded from the operating GES:

   - Gas flowrate from the perimeter piping standpipe
   - GES total flowrate
   - GES inlet PH3 concentration using the Draeger Pac III field instrument (0 to 1,000 ppm range)

5. From these recorded GES operating parameters, the perimeter piping gas PH3 concentration can be calculated as follows:

   Screening level perimeter piping gas PH3 conc. = (GES inlet PH3 concentration x total GES flow)/perimeter pipe standpipe flow

6. Repeat steps 3 and 4 to collect two additional screening-level perimeter piping gas PH3 concentrations. These measurements should be collected at least 10 minutes apart. Once the three screening level perimeter piping gas PH3 concentrations are calculated and recorded, average these three results and record.

7. If the average screening level perimeter piping gas PH3 concentration is greater than or equal to 10,000 ppm, it is considered too unsafe to attempt a direct sampling of perimeter piping gas (second-level sampling). The average screening level will be recorded as the perimeter piping PH3 gas concentration.

8. If the average screening level perimeter piping gas PH3 concentration is less 10,000 ppm, proceed to the second-level PH3 sampling procedure.

4.3.2.2 Second-Level Perimeter Piping Gas PH3 Sampling Procedure

This procedure is intended for use in measuring PH3 in pond perimeter piping gas that is known to be less than 10,000 ppm, based on the screening-level perimeter piping gas sampling. To avoid release of PH3 to the environment, the pond gas sampled during this procedure will be discharged directly to the Gas Extraction (GES) unit to avoid discharge of untreated pond gas to the atmosphere.

1. As this procedure is used when perimeter piping gas PH3 concentration is known, but still very high, i.e., the concentration is well above the concentration that is

immediately dangerous to life or health (IDLH = 50 ppm), sampling personnel should wear a low-range (0 to 20 ppm PH3) monitor and complete all work in compliance with the *RCRA Pond Area Work Rules*. Approach the perimeter piping riser with a Draeger Pac III field instrument (0 to 20 ppm range) measuring ambient air PH3 concentrations. Check and record the PH3 concentration at the breathing zone (approximately 4 to 5 feet above the ground surface). Note that all RCRA pond TMPs are within the RCRA Pond Area and *RCRA Pond Area Work Rules* will apply to all persons entering this area. In addition, all personnel alarms will be recorded including the measurement reading and location (by GPS). An investigation will be performed and documented to determine, if possible, the source of the PH3 causing the alarm.

2. It is assumed that the GES unit is already connected to the perimeter piping riser and was appropriately purged during the screening-level perimeter piping sampling. The GES should remain extracting during the sampling to provide the motive force for the extraction and treatment of extracted perimeter piping gas.

3. Position the perimeter piping gas sampling train and connect to the extraction gas using the couplings as provided at the sampling valve for sampling. The sampling train consists of the following:

    - GeoTech peristaltic sampling pump
    - Gas dilution box assembly
    - High-range (0 to 1,000 ppm) Draeger Pac III PH3 monitor(s) equipped with a Draeger calibration cap
    - Nitrogen gas cylinder for sample dilution
    - Discharge tubing connected to the dilution air inlet to the GES unit or a Tedlar bag for collection of the sampled gas

4. The gas dilution manifold should always be used in the perimeter piping gas sampling train. However:

    a) If the PH3 measurement from the perimeter piping is expected to be below 1,000 ppm (the limit of the high-range Draeger Pac III PH3 monitor), then the pond gas can be sampled directly through the dilution box without any dilution.
    b) If the PH3 concentration is expected to be above 1,000 ppm, then the pond gas will be diluted with nitrogen using the dilution box as appropriate to ensure the diluted sample PH3 concentration is below 1,000 ppm.

5. Mass flow meters in the dilution/mixing manifold indicate the flow rate of pond gas and dilution gas (nitrogen). The combined total flow extracted from the perimeter

piping plus any dilution gas should be approximately 500 ml/min. This is the flow for which the Draeger Pac III calibration cap is designed.

6. Connect the suction side of the GeoTech sampling pump to the appropriate sampling port. Connect the discharge side of the GeoTech sampling pump to the designated dilution/mixing manifold mass flow meter (this is the pond gas containing PH3 to be measured).

7. Connect the nitrogen dilution gas, if required, to the designated flow meter on the manifold.

8. Connect the Draeger Pac III 0 to 1,000 ppm PH3 monitor properly to the discharge line from the dilution/mixing manifold.

9. Position the exhaust tubing from the Draeger Pac III PH3 monitor calibration cap to the inlet port of the dilution inlet of the GES. This will ensure the expelled gas is treated through the GES prior to discharge.

10. Begin sampling pond gas by opening the sampling valve to the perimeter piping sample train and start the sampling pump.

11. Adjust the flow rates of pond gas and the nitrogen gas (if needed) through the dilution/mixing manifold flow meters as required to meet the appropriate dilution ratio. The total gas flow of pond gas and nitrogen dilution gas should be approximately 500 ml/min (as specified by Draeger for their PH3 monitors).

12. Monitor the digital display of the Draeger Pac III PH3 monitor. When the PH3 readings have stabilized, record the Draeger monitor PH3 readings, the dilution/mixing manifold gas flow rates, the calculated dilution rate, and the calculated PH3 concentration corrected for any dilution.

13. Record 3 consecutive data sets, about 10 minutes apart. Record the data on the perimeter piping sampling log sheet. Calculate the average PH3 concentration from the 3 data sets.

14. After the sampling is completed from the perimeter piping, close the sample port valve and disconnect the sample hose. Allow the sample pump to run on fresh air until the sampling equipment has been purged into the dilution inlet port feeding the GES.

15. After the sampling equipment is purged, then turn off the sampling pump.

4.4 GETS Operation Monitoring

The GETS operation and source gas (TMP) monitoring that will be performed during gas extraction and treatment at Pond 16S is described in Section 3.3.4.

4.5 Data Analysis And Report Preparation

The GETS operational status and monitoring and operational data will be reported in the weekly/monthly UAO reports.

4.5.1 Report Content and Submittal

The operational status and monitoring activities will typically be reported in the UAO weekly reports. The weekly reports will include the following:

- Operational performance during the reporting week;
- Tabulated continuous monitoring data for the current week;
- Problems encountered and solutions proposed/implemented;
- Minor and significant operational changes; and,
- Non-conformances identified, field modifications, and actions developed, proposed or implemented; and

In addition to the above information, the monthly UAO reports will include:

- Monitoring results;
- Summary of process operational parameters; and,
- Operational objectives and any recommendations for changes to the GETS operating schedule and/or deployment and operating schedule of GES unit(s) during the upcoming month.

SECTION 5 SUMMARY OF PLAN AND SCHEDULE

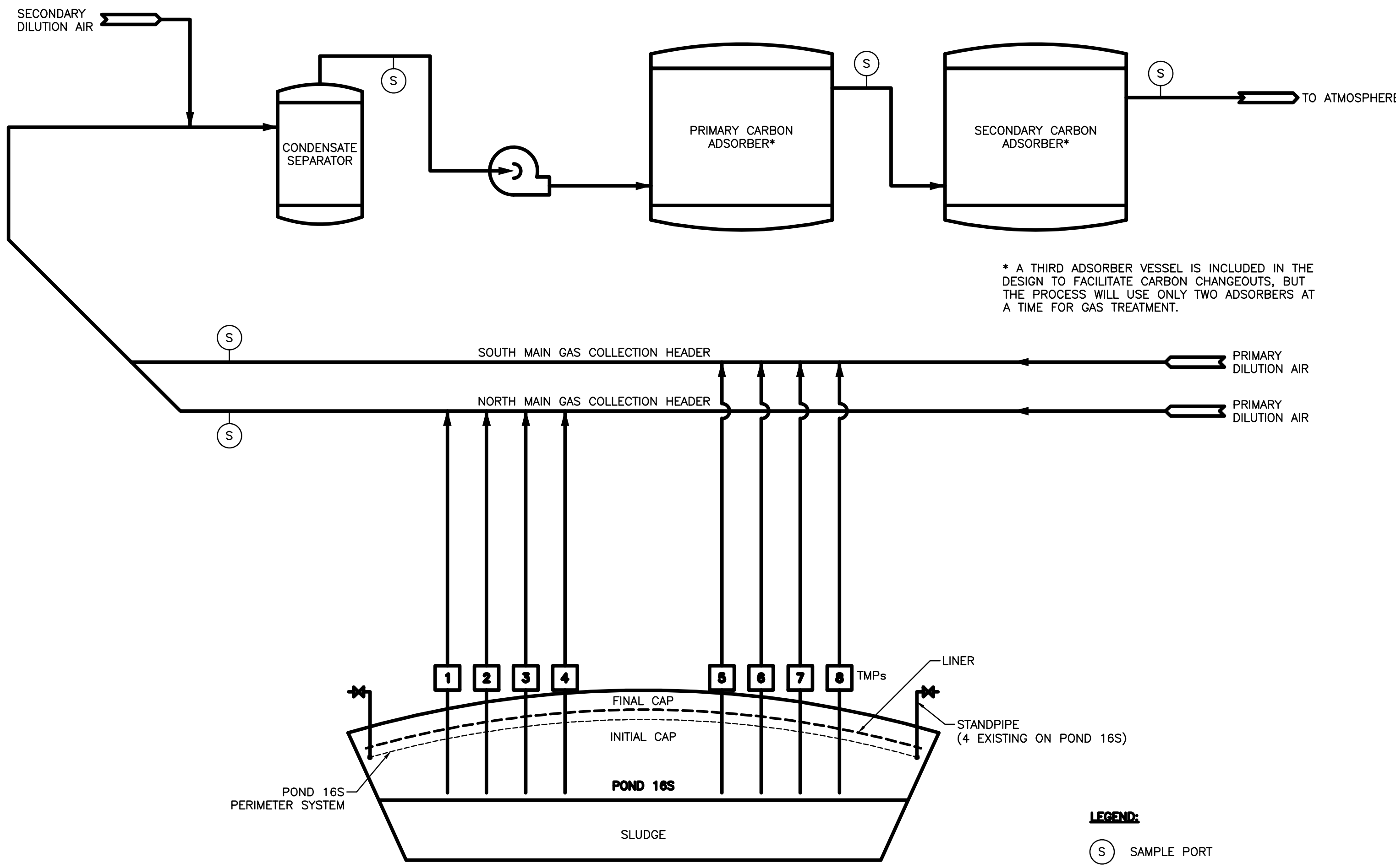
In summary, the readily implementable plan for gas extraction and treatment at Pond 16S is as follows:

- Begin gas extraction from the Pond 16S using the GETS within 10 days after EPA approval of this Work Plan and EPA direction to commence gas extraction pursuant to the approved plan. Initially, the GETS will be operated continuously (24/7).
- Implement (or continue to implement) the PH3 monitoring at Pond 16S as described in Sections 4.1 through 4.4.

As described in the Framework for Post-Closure Operation and Maintenance of RCRA Pond Gas Extraction and Treatment Systems (December 2012), the Pond 16S GETS operating on a 24/7 schedule will achieve a monthly-averaged PH3 mass removal rate of 30 pounds per day (lb/day) provided the source gas PH3 concentration remains above 8,000 ppm (with no significant flow restrictions).

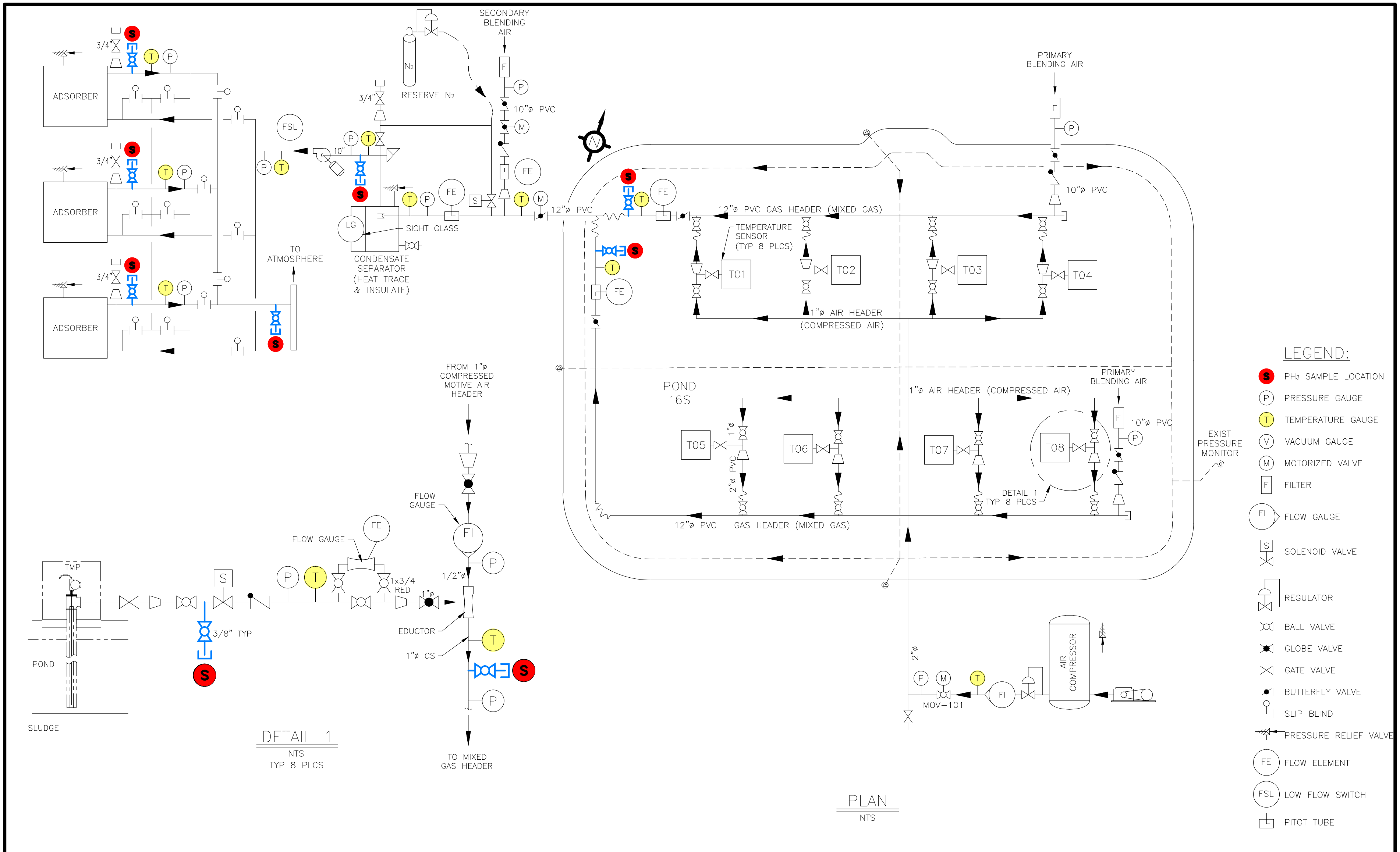
The operation of the GETS may be modified over time, based on monthly review of the monitoring data, to decrease the monthly-averaged daily PH3 mass removal rate. This may be necessary to maintain efficient GETS operation, e.g., maintain 300 ppm inlet PH3 concentrations. Gas extraction at one or more of the Pond 16S perimeter pipe standpipes may be initiated using GES units in addition to or instead of GETS operation. Any GES units deployed to Pond 16S would be operated pursuant to the procedures and monitoring specified in the Pond 18A Interim Work Plan (March 8, 2013). The rate of PH3 removal from Pond 16S may be decreased by reducing the operating time of GETS or by replacing GETS operation with one or more GES units extracting from the perimeter pipe. FMC will notify EPA and obtain EPA approval prior to decreasing the GETS operating schedule and/or deploying GES units at Pond 16S.

When the monthly north perimeter pipe standpipe PH3 concentration decreases below 2,000 ppm as measured using the dilution box method specified in Section 4.3.2.2, FMC will notify EPA and cease gas extraction and treatment at Pond 16S. Monitoring will continue pursuant to the then-applicable EPA-approved plan (e.g., Air Monitoring Plan, amended RCRA Pond Post-Closure Plan).



GETS PROCESS FLOW DIAGRAM

SCALE	WARNING						
NTS	0 1/2 1 IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE	DESIGNED * DRAWN JJC 10/07/08 CHECKED * REV: JJC 03/05/13	MWH	FMC FMC CORPORATION POCATELLO, IDAHO	A&E ENGINEERING INC. POCATELLO, ID	POND 16S CURRENT GETS CONFIGURATION	Figure 3–1



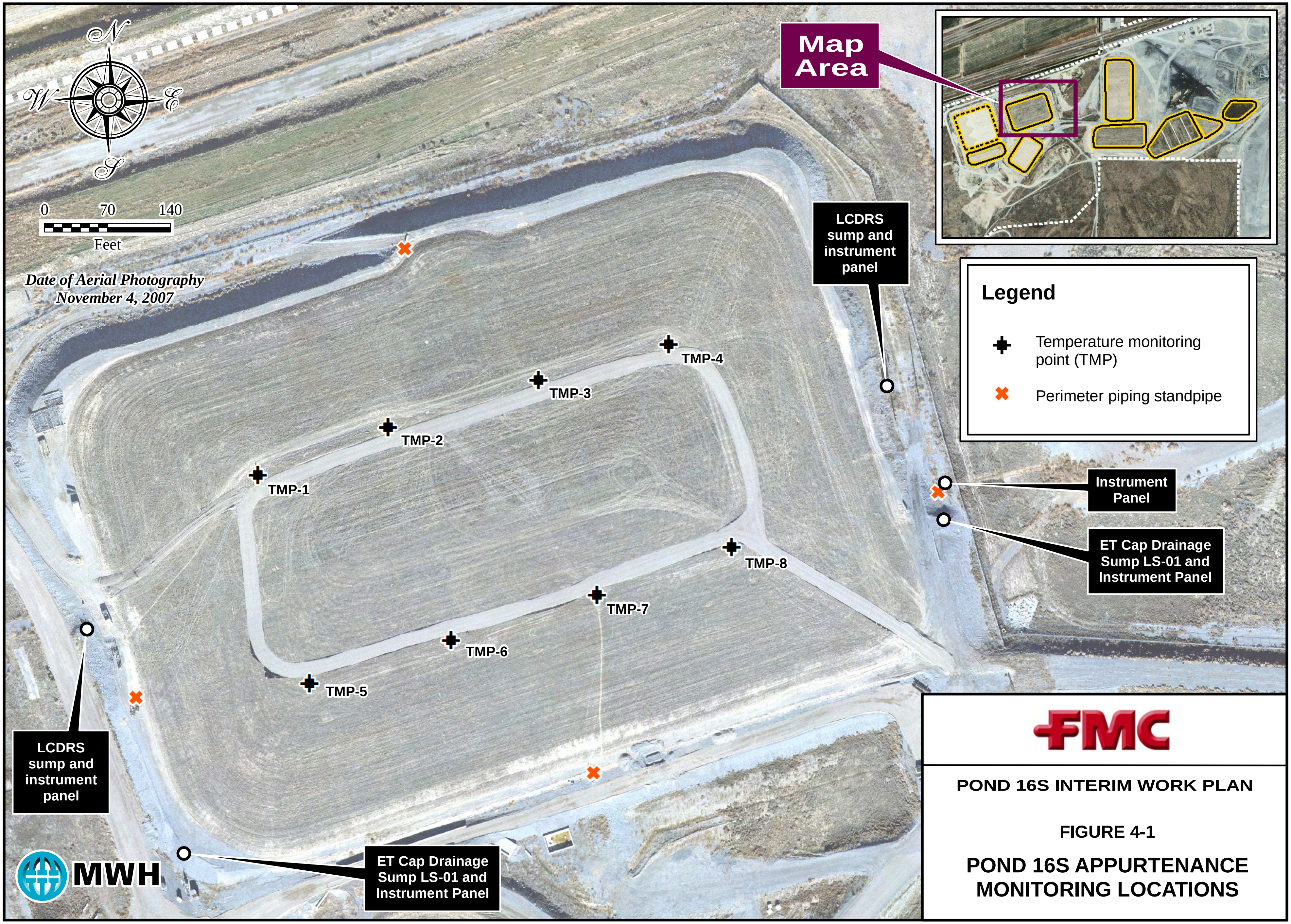
SCALE	WARNING			
NTS	0 1/2 1 IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE	DESIGNED * DRAWN JJC 10/07/08 CHECKED * REV: JJC 03/05/13	MWH	FMC CORPORATION POCATELLO, IDAHO

A&E ENGINEERING INC. POCATELLO, ID

POND 16S GETS PH3 CONCENTRATION AND TEMPERATURE MONITORING LOCATIONS

Figure 3-2

FILE: I:\projects\FMCidaho\FMC_Interim_Workplan\FIGURES\Fig 4-1_FMC_Pond16S_Appurt Mon Locs_Mar2013.mxd



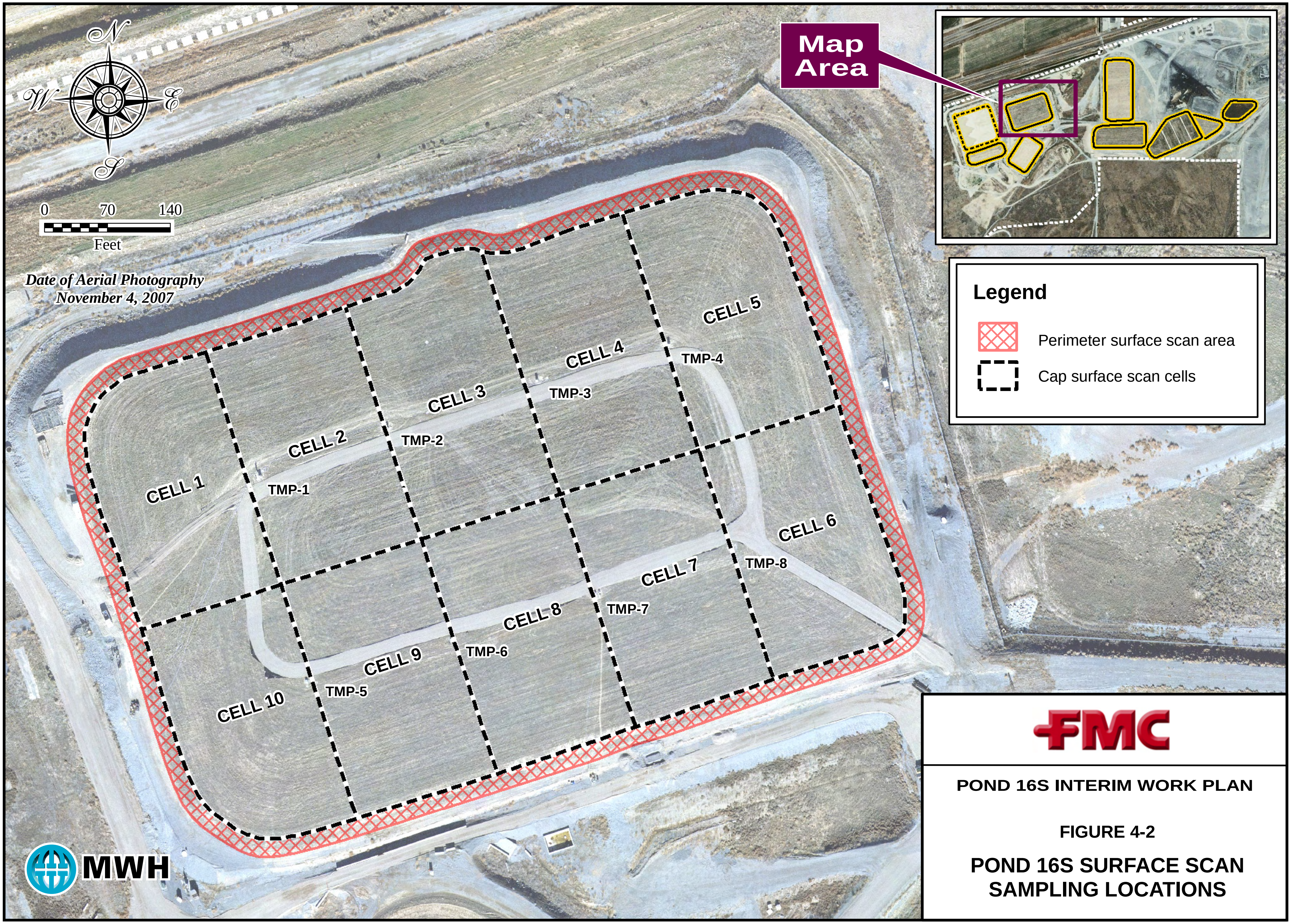
FMC

POND 16S INTERIM WORK PLAN

FIGURE 4-1

POND 16S APPURTENANCE MONITORING LOCATIONS

FILE: I:\projects\FMCidaho\FMC_Interim_Workplan\FIGURES\POND16S\Fig 4-2_FMC_Pond16S_SurfScanSampLocs_Mar2013.mxd



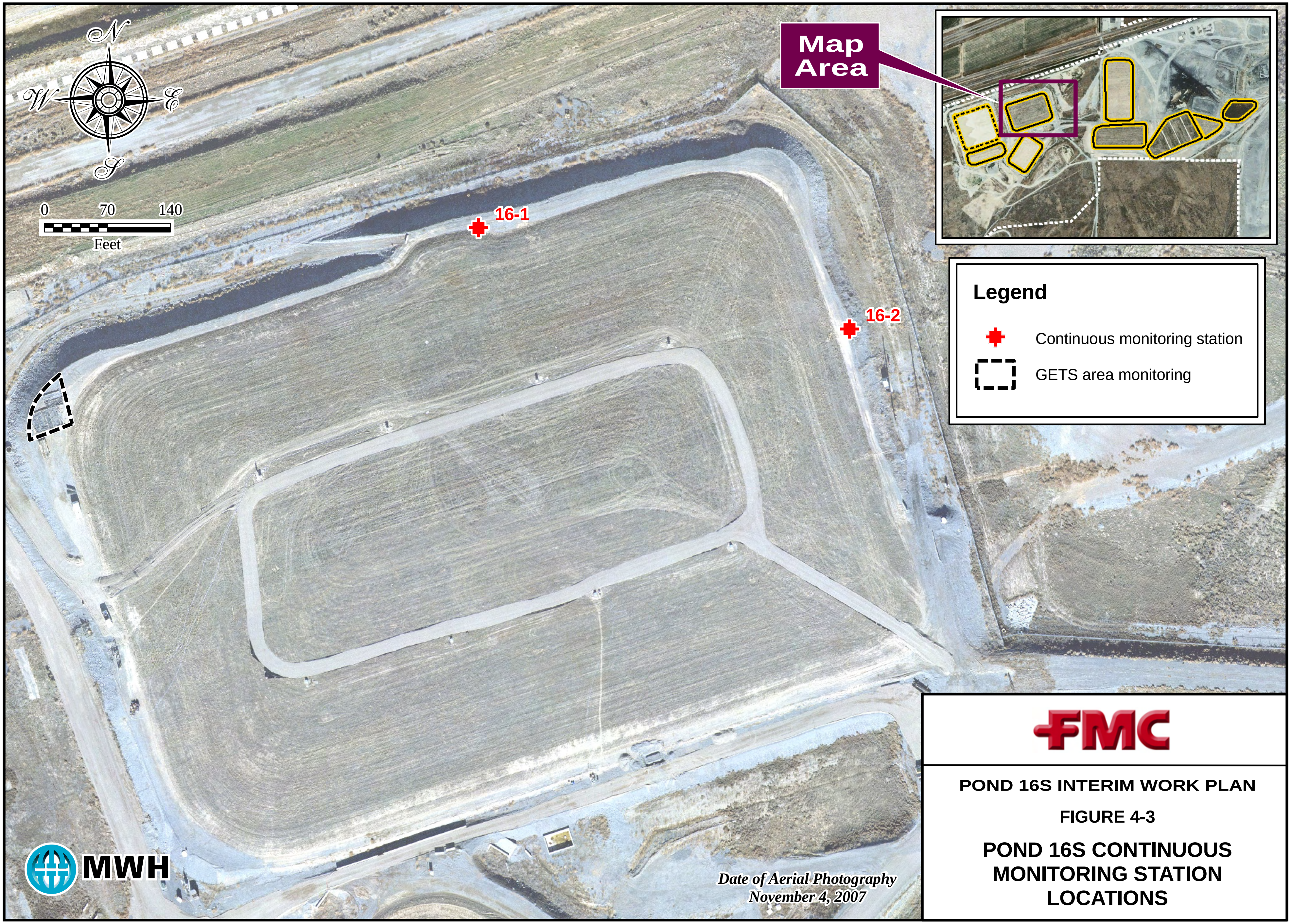
FMC

POND 16S INTERIM WORK PLAN

FIGURE 4-2

POND 16S SURFACE SCAN SAMPLING LOCATIONS

FILE: I:\projects\FMCidaho\FMC_Interim_Workplan\FIGURES\POND16S\Fig 4-3_FMC_Pond16S_Continuous Monitoring Locs_Mar2013.mxd



FMC

POND 16S INTERIM WORK PLAN

FIGURE 4-3

POND 16S CONTINUOUS MONITORING STATION LOCATIONS

Interim Work Plan for Pond 16S Extraction and Treatment

Appendix A

TMP Mechanical Drilling Procedure

TMP MECHANICAL DRILLING PROCEDURE

1. Complete Job Planning Safety Analysis (JPSA) for drilling of specific TMP:

   a. Identify potential job hazards.
   b. Prescribe appropriate monitoring during the procedure, i.e., PH_3 monitoring.
   c. Prescribe appropriate PPE for employees performing procedure.

2. Prepare TMP for drilling:

   a. Remove TMP enclosure to provide access to TMP piping.
   b. Connect the mobile GES unit (with high-range flow meter) to the extraction connection on the TMP casing.
   c. Utilizing the sample port connection on the GES extraction piping, begin nitrogen purging into the TMP casing. Purge down the TMP until at least four conduit volumes have been purged through the TMP.
   d. Stop nitrogen purge and begin sweep gas flow using the mobile GES.
   e. Remove TMP thermocouple from TMP well. Note the length of the stainless-steel sheath removed from the casing.
   f. Continue sweep gas flow using the mobile GES.

3. Construct drill assembly:

   a. Build a drill assembly of the required length based on the length of the thermocouple sheath removed from the TMP well.
   b. The final section of the drill assembly must be the 12-inch drill adaptor rod designed to attach to the rotor-hammer drill.

4. Drill hole in bottom of TMP casing

   a. Insert drill assembly into ¾-inch thermocouple conduit.
   b. Accurately note the depth when the drill bit contacts the bottom of the casing.
   c. Attach rotor-hammer drill to drill bit adaptor assembly.
   d. Slowly begin drilling (whenever any binding is observed the drill will be reversed to relieve the binding).
   g. Track the drilling progress (It is expected that 2 to 3 inches of drilling will be required to completely break-through the drive cap bottom of the TMP casing).
   h. Stop drilling when break-through occurs. The design of the drilling coupling will prevent penetration beyond 10 inches below the drive cap.

5. Remove drill assembly from TMP well casing and observe the drill bit to determine bottom of drive cap condition (i.e. dry or wet).

6. Determine the TMP “max” flow capability:

    a. Install blind flange on the top flange of the TMP casing.
    b. Determine “max” flow capability utilizing the mobile GES.
    c. If desired extraction flow is possible then re-install TMP thermocouple (Step 7).
    d. If desired flow is not possible then it may be necessary to repeat Steps 2 thru 6.

7. Re-install TMP thermocouple:

    a. Shut off gas extraction through the mobile GES.
    b. Utilizing the sample port connection on the GES extraction piping, begin nitrogen purging into the TMP casing. Purge down the TMP until at least four conduit volumes have been purged through the TMP.
    c. Loosen bolts on blind flange on the top of the TMP.
    d. Re-establish the sweep gas flow utilizing the mobile GES.
    e. Remove the blind flange on the top flange of the TMP casing and re-install the TMP thermocouple with flange.
    f. Replace and secure the TMP enclosure.